

CLAIMS

What is claimed is:

1. An optical device comprising:
programmable elements formed on a surface of a substrate,
5 said elements being selectively programmed to create a reflective filament pattern,
said surface of said substrate for reflecting radiation in a selected optical pattern.
2. The device of Claim 1 wherein said elements are formed in a two dimensional
array.
3. The device of Claim 1 wherein each of said elements has conductive contacts, and
10 wherein said contacts are selected from metals consisting of aluminum and aluminum
alloys.
4. The device of Claim 1 wherein said elements are selectively programmed to
create a reflective filament pattern to convey information.
5. The device of Claim 1 further comprising an address decoder on said substrate for
15 selectively addressing said elements for programming.
6. The device of Claim 1 further comprising optical fibers receiving reflected light
from filaments of programmed elements.
7. The device of Claim 6 wherein said fibers are located proximate to said surface of
said substrate.
8. The device of Claim 1 further comprising a light source providing light upon said
20 surface of said substrate for reflecting light from filaments of programmed elements.
9. The device of Claim 1 further comprising a second substrate having a
photosensitive material that is selectively exposed by light reflected from filaments of
programmed elements.

10. The device of Claim 1 further comprising an optical element positioned with respect to said surface for focusing light on filaments of programmed elements.

11. The device of Claim 1 further comprising an optical element for focusing light reflected from filaments of programmed elements.

12. The device of Claim 1 further comprising a package containing said substrate, said package having a window exposing said elements, said package having conductive terminals for programming said elements.

13. The device of Claim 1 wherein said elements comprise less than 100 elements.

14. The device of Claim 1 wherein said elements comprise more than 100 elements.

15. The device of Claim 1 wherein said elements comprise more than 1,000 elements.

16. The device of Claim 1 wherein said elements comprise more than 1,000,000 elements.

17. The device of Claim 1 further comprising:

a light source positioned to have light reflected off said surface of said substrate corresponding to said filament pattern; and

a photosensitive layer receiving the reflected light.

18. The device of Claim 17 wherein said photosensitive layer is formed over a DNA microarray.

19. The device of Claim 17 wherein said photosensitive layer is formed over a semiconductor wafer for forming an integrated circuit.

20. The device of Claim 1 wherein said selected optical pattern is an optical image.

21. The device of Claim 1 wherein said selected optical pattern is an optical code.

22. The device of Claim 1 wherein said selected optical pattern is a pattern for

Sub. A⁴
exposing photosensitive material.

23. The device of Claim 1 wherein said programmable elements are diodes.
24. The device of Claim 1 wherein said programmable elements are zener diodes.
25. The device of Claim 1 wherein said programmable elements are transistors.
- 5 26. The device of Claim 1 further comprising semiconductor regions over which are formed conductive contacts for each programmable element.
27. The device of Claim 1 wherein said substrate is a semiconductor substrate.

28. The device of Claim 1 further comprising:

a radiation source applying radiation to a first side of said substrate; and

10 a radiation detector receiving a pattern of radiation that has passed through a second side of said substrate, each said filament at least partially blocking said radiation from passing through said substrate, said radiation detector generally electrical signals corresponding to said filament pattern.

29. The device of Claim 28 wherein said radiation source generates infra-red light.

Sub. A⁵
15 30. The device of Claim 1 wherein said filament pattern is both optically detectable, by detecting said optical pattern, and electrically detectable, by detecting electrical shorts between said contacts.

31. The device of Claim 1 further comprising a read circuit electrically coupled to said elements for reading said elements after programming.

20 32. The device of Claim 31 wherein said read circuit is formed on said substrate.

Sub. A⁶
33. The device of Claim 1 wherein said programmable elements comprise normally-shortening conductive filaments between two filament contact areas, said filaments forming an open circuit between said contact areas when blown during programming.

34. A method for selectively reflecting light comprising:
programming an array of elements on a surface of a substrate to create a pattern of
reflective filaments; and

5 applying radiation to said surface, such that radiation is reflected from said
filaments in a selected pattern.

35. The method of Claim 34, wherein said selected pattern conveys optical
information.

36. The method of Claim 34 wherein said selected pattern is an optical image.

37. The method of Claim 34 wherein said selected pattern is an optical code.

10 38. The method of Claim 34 wherein said selected pattern is a pattern for exposing
photosensitive material to light.

39. The method of Claim 34 further comprising:
detecting a pattern of radiation that has passed through said substrate, said
filaments at least partially blocking said radiation from passing through said substrate.

15 40. The method of Claim 34 wherein said elements are diodes.

41. The method of Claim 34 wherein said elements are zener diodes.

42. The method of Claim 34 wherein said elements are transistors.

43. The method of Claim 34 wherein said elements are normally-shorting conductive
filaments between two filament contact areas.

20 44. The method of Claim 34 wherein said elements are fuses.

45. The method of Claim 34 wherein said elements are anti-fuses.